



Chapter 3: Introduction to SQL

Database System Concepts, 7th Ed.

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Outline

- Overview of The SQL Query Language
- SQL Data Definition
- Basic Query Structure of SQL Queries
- Additional Basic Operations
- Set Operations
- Null Values
- Aggregate Functions
- Nested Subqueries
- Modification of the Database



Modification of the Database

- Deletion of tuples from a given relation.
- Insertion of new tuples into a given relation
- Updating of values in some tuples in a given relation



Deletion

- Delete all instructors

delete from *instructor*

- Delete all instructors from the Finance department

delete from *instructor*
where *dept_name* = 'Finance';

- *Delete all tuples in the instructor relation for those instructors associated with a department located in the Watson building.*

delete from *instructor*
where *dept name* in (**select** *dept name*
from *department*
where *building* = 'Watson');



Deletion (Cont.)

- Delete all instructors whose salary is less than the average salary of instructors

```
delete from instructor  
where salary < (select avg (salary)  
                from instructor);
```

- Problem: as we delete tuples from *instructor*, the average salary changes
- Solution used in SQL:
 1. First, compute **avg** (*salary*) and find all tuples to delete
 2. Next, delete all tuples found above (without recomputing **avg** or retesting the tuples)



Insertion

- Add a new tuple to *course*

```
insert into course  
  values ('CS-437', 'Database Systems', 'Comp. Sci.', 4);
```

- or equivalently

```
insert into course (course_id, title, dept_name, credits)  
  values ('CS-437', 'Database Systems', 'Comp. Sci.', 4);
```

- Add a new tuple to *student* with *tot_creds* set to null

```
insert into student  
  values ('3003', 'Green', 'Finance', null);
```



Insertion (Cont.)

- Make each student in the Music department who has earned more than 144 credit hours an instructor in the Music department with a salary of \$18,000.

```
insert into instructor  
  select ID, name, dept_name, 18000  
  from   student  
  where  dept_name = 'Music' and total_cred > 144;
```

- The **select from where** statement is evaluated fully before any of its results are inserted into the relation.

Otherwise queries like

```
insert into table1 select * from table1  
would cause problem
```



Updates

- Give a 5% salary raise to all instructors

```
update instructor  
  set salary = salary * 1.05
```

- Give a 5% salary raise to those instructors who earn less than 70000

```
update instructor  
  set salary = salary * 1.05  
  where salary < 70000;
```

- Give a 5% salary raise to instructors whose salary is less than average

```
update instructor  
  set salary = salary * 1.05  
  where salary < (select avg (salary)  
                  from instructor);
```




Updates (Cont.)

- Increase salaries of instructors whose salary is over \$100,000 by 3%, and all others by a 5%
 - Write two **update** statements:

```
update instructor
  set salary = salary * 1.03
  where salary > 100000;
update instructor
  set salary = salary * 1.05
  where salary <= 100000;
```
 - The order is important
 - Can be done better using the **case** statement (next slide)



Case Statement for Conditional Updates

- Same query as before but with case statement

update *instructor*

set *salary* = **case**

when *salary* <= 100000 **then** *salary* * 1.05

else *salary* * 1.03

end



Updates with Scalar Subqueries

- Recompute and update *tot_creds* value for all students

```
update student S
set tot_cred = (select sum(credits)
                from takes, course
                where takes.course_id = course.course_id and
                    S.ID = takes.ID and
                    takes.grade <> 'F' and
                    takes.grade is not null);
```

- Sets *tot_creds* to null for students who have not taken any course
- Instead of **sum**(*credits*), use:

```
case
  when sum(credits) is not null then sum(credits)
  else 0
end
```



End of Chapter 3